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EXAMINER

SUCHFIELD, GEORGE A

ART UNIT PAPER NUMBER

3672

DATE MAILED: 07/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/841,284

Applicant(s)

VINEGAR ET AL.

Examiner

George Suchfield

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2193-2269, 5081-5090 and 5150-5198 is/are pending in the application.
- 4a) Of the above claim(s) 2196-2198, 2235-2237 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2193-2195, 2199-2234, 2238-2269, 5081-5090 and 5150-5198 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 2193-2269, 5081-5090 and 5150-5198 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 08 March 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10-14.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2208-2211, 2247-2250, 5159-5162 and 5183-5186 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2208-2111, 2247-2250, 5159-5162 and 5183-5186 are indefinite because, insofar as a "hydrocarbon", by definition, comprises organic compounds consisting only of carbon and hydrogen, the recited "condensable hydrocarbons" cannot include nitrogen, oxygen, sulfur and/or oxygen-containing compounds. Claims 2208-2210, 2247-2249, 5159-5161 and 5183-5186 appear further inaccurate with respect to the terms "nitrogen", "oxygen" and "sulfur", per se, because they are not even organic compounds, hydrocarbon or not. It appears that such terms/recitations should instead appear as, e.g., -- nitrogen compounds --.

4. Conflicts exist between claims of the following related ninety-one co-pending applications which includes the present application:

09/840,936; 09/840,937; 09/841,000; 09/841,060; 09/841,061; 09/841,127; 09/841,128; 09/841,129; 09/841,130; 09/841,131; 09/841,170; 09/841,193; 09/841,194; 09/841,195; 09/841,238; 09/841,239; 09/841,240; 09/841,283; 09/841,284; 09/841,285; 09/841,286; 09/841,287; 09/841,288; 09/841,289; 09/841,290; 09/841,291; 09/841,292; 09/841,293; 09/841,294; 09/841,295; 09/841,296; 09/841,297; 09/841,298; 09/841,299; 09/841,300; 09/841,301; 09/841,302; 09/841,303; 09/841,304; 09/841,305; 09/841,306; 09/841,307; 09/841,308; 09/841,309; 09/841,310; 09/841,311; 09/841,312; 09/841,429; 09/841,430; 09/841,431; 09/841,432; 09/841,433; 09/841,434; 09/841,435; 09/841,436; 09/841,437;

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09/841,438; 09/841,439; 09/841,440; 09/841,441; 09/841,442; 09/841,443; 09/841,444; 09/841,445; 09/841,446; 09/841,447; 09/841,448; 09/841,449; 09/841,488; 09/841,489; 09/841,490; 09/841,491; 09/841,492; 09/841,493; 09/841,494; 09/841,495; 09/841,496; 09/841,497; 09/841,498; 09/841,499; 09/841,500; 09/841,501; 09/841,502; 09/841,632; 09/841,633; 09/841,634; 09/841,635; 09/841,636; 09/841,637; 09/841,638; and 09/841,639.

37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. The discussion below sets forth the Office's basis for its determination that each of these ninety-one applications contains at least one claim that conflicts with another one of the related co-pending applications identified above. Each of these ninety-one applications includes the same specification and collectively these applications present over five thousand claims. The Office has shown that each of these ninety-one applications contains at least one claim that conflicts with another one of the related co-pending applications identified above, and an analysis of each of five thousand+ claims in the ninety-one related co-pending applications would be an extreme burden on the Office requiring tens of thousands of claim comparisons. Therefore, the Office is requiring applicant to resolve the conflict between these applications and comply with 37 CFR 1.78(b) by either:

- (1) filing a terminal disclaimer in each of the related ninety-one applications terminally disclaiming each of the other twenty-eight applications; or,
- (2) provide a statement that all claims in the ninety-one applications have been reviewed by applicant and that no conflicting claims exist between the applications. Such a statement must set forth factual information identify how all the claims in the instant application are distinct and separate inventions from all the claims in the above identified ninety-one applications.

Applicant is reminded that obviousness-type double patenting analysis entails a two-step process: (1) the claims of this application and the other ninety-one applications must be construed; and (2) the claims of this application must be compared with the claims of the other applications to determine whether the differences in subject matter between the two claims render the claims patentably distinct. See Georgia-Pacific Corp. v. United States Gypsum Co., 195 F.3d 1322, 1326, 52 USPQ2d 1590, 1593 (Fed. Cir. 1999), and General Foods Corp. v. Studiengesellschaft Kohle, 972 F.2d 1272, 1279, 23 USPQ2d 1839, 1844 (Fed. Cir. 1992). As the Court of Customs and Patent Appeals (CCPA) explained: "[t]he fundamental reason for the rule [against "double patenting"] is to prevent unjustified timewise extension of the right to exclude granted by a patent no matter how the extension is brought about." In re Van Ornum, 686 F.2d 937, 943-44, 214 USPQ 761, 766 (CCPA 1982) (brackets and emphasis in the original) (quoting In re Schneller, 397 F.2d 350, 354, 158 USPQ 210, 214 (CCPA 1968)). Furthermore, the requirement will be held in abeyance until such time as the examiner indicates allowable subject matter. Examples of conflicts appear in the rejections here-in-below.

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5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321© may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 2193-2269, 5081-5090 and 5150-5198 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over copending applications (including the present application):

09/840,936; 09/840,937; 09/841,000; 09/841,060; 09/841,061; 09/841,127; 09/841,128; 09/841,129; 09/841,130; 09/841,131; 09/841,170; 09/841,193; 09/841,194; 09/841,195; 09/841,238; 09/841,239; 09/841,240; 09/841,283; 09/841,284; 09/841,285; 09/841,286; 09/841,287; 09/841,288; 09/841,289; 09/841,290; 09/841,291; 09/841,292; 09/841,293; 09/841,294; 09/841,295; 09/841,296; 09/841,297; 09/841,298; 09/841,299; 09/841,300; 09/841,301; 09/841,302; 09/841,303; 09/841,304; 09/841,305; 09/841,306; 09/841,307; 09/841,308; 09/841,309; 09/841,310; 09/841,311; 09/841,312; 09/841,429; 09/841,430; 09/841,431; 09/841,432; 09/841,433; 09/841,434; 09/841,435; 09/841,436; 09/841,437; 09/841,438; 09/841,439; 09/841,440; 09/841,441; 09/841,442; 09/841,443; 09/841,444; 09/841,445; 09/841,446; 09/841,447; 09/841,448; 09/841,449; 09/841,488; 09/841,489; 09/841,490; 09/841,491; 09/841,492; 09/841,493; 09/841,494; 09/841,495; 09/841,496; 09/841,497; 09/841,498; 09/841,499; 09/841,500; 09/841,501; 09/841,502; 09/841,632; 09/841,633; 09/841,634; 09/841,635; 09/841,636; 09/841,637; 09/841,638; and 09/841,639.

Although the conflicting claims are not identical, they are not patentably distinct from other. For example; claim 564, currently pending in S.N. 09/841,430 is an obvious variation of claim 2200 pending herein, and claim 565 currently pending in 09/841,430 is an obvious variation of claim 2239 pending herein. More specifically, both claim 564 and 2200 call for heating a section of a formation to increase the permeability to greater than about 100 millidarcy while controlling the pressure as a function of temperature, or controlling the temperature as a function of pressure; the precise extent of formation heated, i.e., a majority of the section or a majority of a portion of the section is deemed a matter of choice or design based on, e.g., formation characteristics or economic feasibility. Similarly, both claim 565 and 2239 call for heating a section of a formation to increase the permeability substantially uniformly while controlling the pressure as a function of temperature, or controlling the temperature as a function of pressure; the precise extent of formation heated, i.e., a majority of the section or a majority of a portion of the section is deemed a matter of choice or design based on, e.g., formation characteristics or economic feasibility.

It is further noted that claims 2193-2269, 5081-5090 and 5250-5198 are specifically not patentably distinct from claims 2193-2269 and 5317-5327 of applicant's copending application 09/841,000 because the coal formation treated by the method of, e.g., claim 2193 or 5081 of this pending application is deemed broad enough to encompass the hydrocarbon formation of claim 2193 or 5317 of the copending application. Otherwise, the remaining claims of both this and the copending application appear to correspond.

See MPEP 804.02 IV for a discussion of multiple double patenting rejections and the requirements for a single terminal disclaimer.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

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7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 2193, 2195, 2205-2218, 2226, 2227, 2230-2232, 2234, 2244-2257, 2268, 2269, 5081, 5083, 5085, 5087-5090, 5175, 5177, 5182-5192, 5196 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Camacho et al (4,067,390).

Camacho et al (col. 7, line 32 – col. 8, line 57) discloses a process for heating a coal formation wherein the heat imparted causes devolatilization and “cracking or fracturing” of the coal, e.g., as illustrated by zone (40,40’) of Figures 4 and 5. Such heating effect on the coal formation is deemed to necessarily or obviously increase the permeability, as called for in claims 2193, 2232, 5081 and 5175. It is further deemed that such permeability increase will inherently or obviously be substantially uniform, as called for in claims 2232, 2227, 5196 as illustrated in Figures 4 and 5. Such permeability increase is deemed to necessarily or inherently encompass an increase to “greater than about 100 millidarcy” or “greater than about 5 Darcy”, as called for in claims 2193, 2226, 5175; alternatively, to increase the permeability to greater than 100 millidarcy or 5 Darcy would have been an obvious matter of choice in order to ensure adequate fluid flow through the formation. The plasma arc torch (25) is deemed to comprise the “heat source” of these claims; it is further deemed an electrical heater as called for in claim 5085. Camacho et al further encompasses the process steps of claim 5087-5090, such as monitoring the composition of the produced mixture (note Figure 9; col. 9, lines 1-18, 56-69). In this regard, it is further deemed that subsequent steps in response to such monitoring as adjusting the steam flow rate and torch power, will also inherently or obviously control the pressure in the coal formation, e.g., by the resulting varying volatilization or gasification of the hydrocarbon constituents or moisture evaporation rate.

Pyrolysis clearly occurs in the said formation, as called for in claims 2195, 2234 and 5177.

Regarding claims 2205-2218, 2244-2257, 5175 and 5182-5192, it is deemed that the myriad hydrocarbon product mixtures recited in these claims would necessarily or obviously

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occur in carrying out the heating process of Camacho et al, i.e., the precise composition of the product fluids is seen as dictated by the type of coal naturally occurring in the particular coal formation actually encountered in the field. Moreover, it would be an obvious matter of choice to operate the Camacho et al process to minimize what would be considered refinery contaminants, such as sulfur, nitrogen and/or oxygen in the product mixtures. Similarly, it would be obvious to reduce or minimize the amount of asphaltenes in the product mixtures for optimum downstream refining. Also, in the event that the particular coal deposit encountered yields ammonia gas, it would be an obvious expedient to utilize it in a commercial process such as fertilizer production.

Regarding claims 2230, 2231, 5087 Camacho et al (note Figure 8 and col. 9, lines 20-50) clearly discloses that the plasma arc torch heat sources (25) may be provided in a repeating triangular pattern.

10. Claims 2201-2204, 2219-2222, 2228-2231, 2240-2243, 2258-2261, 2266-2269, 5150, 5152, 5154-5170, 5172-5174, 5179-5181, 5193-5195, 5197, 5198 are rejected under 35 U.S.C. 103(a) as being unpatentable over Camacho et al (4,067,390).

The precise heating rate and thermal conductivity recited in claims 2201, 2202, 2240, 2241, 5154, 5179, are deemed obvious matters of choice or design based on, e.g., the quality and amount of the in place hydrocarbon present in the particular coal formation encountered in the field, consistent with objective of Camacho et al to provide a low rate of heating (col. 10, lines 34-40).

Insofar as the coal formation (11) may be of low initial permeability and/or porosity, it is deemed that at least some transfer of heat by conduction from the point(s) of combustion will

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necessarily or obviously occur during the Camacho et al process, as called for in claim 2203, 2242, 5155, 5180.

The thermal conductivity recited in claim 2204, 2243, 5156 is deemed an obvious matter of choice or design based on, e.g., the quality and type of the coal formation present and/or the matrix characteristics of the particular coal formation encountered in the field.

The steps of 2219-2222, 2228, 2258-2261, 2266, 5169, 5170, 5173, 5193-5195, 5197 such as controlling the heat or pressure in the formation, are deemed obvious matters of choice or design in carrying out the process of Camacho et al. In this regard, Camacho et al teaches that steam injection temperature, pressure and/or volume may be controlled in response to monitoring of the fluid products. In addition, overall operating conditions within the coal formation may be altered (noted col. 5, lines 20-27) to vary the product fluid composition(s).

Regarding claims 2229-2231, 2267-2269, 5174, 5198, Camacho et al in the embodiment of Figure 10 discloses that myriad heating wells (65) may surround a production well or shaft (74). The precise number of such heating wells provided, as called for in these claims, is deemed an obvious matter of choice or design in carrying out the process of Camacho et al based on, e.g., the overall areal extent of the coal formation(s) encountered in exploiting an actual reservoir encountered in the field.

11. Claims 2225 and 2264 are rejected under 35 U.S.C. 103(a) as being unpatentable over Camacho et al (4,067,390) as applied to claim 2270 above, and further in view of Hoekstra et al (4,353,418) or Garrett (3,661,423).

It would have been obvious to one of ordinary skill in the art to which the invention pertains to hydrogenate the hydrocarbons produced from the heating process of Camacho et al,

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which hydrocarbons may be in liquid and/or vaporous form, with hydrogen also produced by the heating process of Camacho et al (col. 2, line 44-49), as taught by Hoekstra et al (note the Abstract and figure) or Garrett (col. 4, lines 50-54), in order to simultaneously provide an exemplary "non-energy use" for hydrogen produced by Camacho et al and improve the overall quality of the liquid and/or condensable hydrocarbon fluids produced by Camacho et al.

12. Claims 2193, 2195, 2200, 2205-2218, 2226, 2227, 2232, 2234, 2244-2257, 5081, 5083, 5088, 5090, 5175, 5177, 5182-5192, 5196 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Justheim (3,766,982).

Justheim'982 discloses the heating of a subterranean solid "hydrocarbonaceous" formation, which may comprise coal, wherein such heating increases the permeability of the coal formation (note col. 4, lines 15-20). It is deemed that such permeability increase will inherently or obviously be substantially "uniform", as called for in claims 2232, 2227 and 5196, e.g., since the injected heated air which causes the permeability increase permeates throughout the coal formation. Also, such permeability increase is deemed to necessarily or inherently encompass an increase to "greater than about 100 millidarcy" or "greater than about 5 Darcy", as called for in claims 2193, 2226, 5175; alternatively, to increase the permeability to greater than 100 millidarcy or 5 Darcy would have been an obvious matter of choice in order to ensure adequate fluid flow through the formation. The hot air itself is deemed to comprise a "heat source", as called for in these claims.

Pyrolysis clearly occurs in the said formation, as called for in claims 2195, 2234 and 5177.

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As per claim 2200, while in situ or “natural” combustion is not explicitly set forth in Justheim, it is deemed that the injection of heated air, especially at a temperature of 2000oF, will necessarily or obviously ignite the coal at some point in the coal formation, e.g., upon contact with any in-place methane or volatile hydrocarbon(s) present, and effect such in situ combustion and thus comprise a “natural distributed combustor”, as broadly recited.

Regarding claims 2205-2218, 2244-2257, 5175 and 5182-5192, it is deemed that the myriad hydrocarbon product mixtures recited in these claims would necessarily or obviously occur in carrying out the heating process of Justheim, i.e., the precise composition of the product fluids is seen as dictated by the type of coal naturally occurring in the particular coal formation actually encountered in the field. Moreover, it would be an obvious matter of choice to operate the Camacho et al process to minimize what would be considered refinery contaminants, such as sulfur, nitrogen and/or oxygen in the product mixtures. Similarly, it would be obvious to reduce or minimize the amount of asphaltenes in the product mixtures for optimum downstream refining. Also, in the event that the particular coal deposit encountered yields ammonia gas, it would be an obvious expedient to utilize it in a commercial process such as fertilizer production.

13. Claims 2201-2204, 2219-2224, 2228, 2240-2243, 2258-2263, 2266, 5150, 5152, 5154-5173, 5179-5181, 5193-5195 and 5197 are rejected under 35 U.S.C. 103(a) as being unpatentable over Justheim (3,766,982).

The precise heating rate and thermal conductivity recited in claims 2201, 2202, 2240, 2241, 5154, 5179, are deemed obvious matters of choice or design based on, e.g., the quality and amount of the in place hydrocarbon present in the particular coal formation encountered in the field in carrying out the process of Justheim.

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Insofar as the coal formation (11) may be of low initial permeability and/or porosity, it is deemed that at least some transfer of heat by conduction from the point(s) of combustion will necessarily or obviously occur during the Justheim process, as called for in claim 2203, 2242, 5155, 5180.

The thermal conductivity recited in claim 2204, 2243, 5156, 5181 is deemed an obvious matter of choice or design based on, e.g., the quality and type of the coal formation present and/or the matrix characteristics of the particular coal formation encountered in the field.

As per claim 2220, Justheim specifically calls for injection of hydrogen into the coal formation to effect hydrogenation of the volatilized/pyrolyzed hydrocarbons evolved, thus the production fluids actually produced will necessarily or obviously include a partial pressure of hydrogen, with the precise amount thereof deemed an obvious matter of choice or design, based on, e.g., the particular coal formation encountered.

As per claim 2221, 2260, insofar as Justheim strives to control the amount of hydrogen present throughout the process to minimize "danger of accidental explosions", it would have been an obvious expedient or matter of choice to monitor the partial pressure of hydrogen at the production well(s) using conventional or commercially-available monitoring means.

The steps of 2219, 2222, 2228, 2258, 2261, 2266, 5169, 5170, 5173, 5193, 5195, 5197 such as controlling the heat or pressure in the formation, are deemed obvious matters of choice or design in carrying out the process of Justheim.

As per claim 2223, 2224, 2262, 2263, 5171, Justheim injects hydrogen into the heated coal formation to hydrogenate the volatilized/pyrolyzed hydrocarbons evolved; and the hydrogen

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provided may further be obtained from production fluids obtained from the coal formation (col. 3, lines 1-9).

14. Claims 2225 and 2264 are rejected under 35 U.S.C. 103(a) as being unpatentable over Justheim (3,766,982) as applied to claim 2193 above, and further in view of Hoekstra et al (4,353,418) or Garrett (3,661,423).

It would have been obvious to one of ordinary skill in the art to which the invention pertains to further hydrogenate the partially-hydrogenated hydrocarbons produced from the heating process of Justheim, with hydrogen circulated or produced by the heating process of Justheim, as taught by Hoekstra et al (note the Abstract and figure) or Garrett (col. 4, lines 50-54), in order to improve the overall quality of the liquid and/or condensable hydrocarbon fluids produced by Justheim by fully or completing hydroconverting/hydrogenating refinement process.

15. Claims 2230, 2231, 2268, 2269 are rejected under 35 U.S.C. 103(a) as being unpatentable over Justheim (3,766,982) as applied to claim 2193 above, and further in view of Salomonsson (2,914,309) or Camacho et al (4,067,390).

It would have been obvious to one of ordinary skill in the art to which the invention pertains to carry out the multiple well heating embodiment of Justheim (col. 2, lines 30-55) by providing or laying out the wells in a triangle, and/or repeating triangle pattern, as disclosed by Salomonsson (note Figure 3 and col. 3, lines 5-34) or Camacho et al (note Figure 8) in order to enhance the overall heating/pyrolysis effected by optimizing well location.

16. Claims 2193-2195, 2199, 2200, 2203, 2205-2215, 2217, 2218, 2226, 2227, 2232-2234, 2238, 2239, 2242, 2244-2254, 2256, 2257, 2265, 5081-5085, 5175-5178, 5180, 5182-5190,

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5192, 5196 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ljungstrom (2,923,535).

Ljungstrom discloses a process for heating a coal formation wherein the heat imparted causes volatilization, pyrolysis and gasification of hydrocarbon constituents, as well as causing an increase in permeability of such coal formation (note col. 2, lines 1-24), as called for in claim 5081. It is further deemed that such permeability increase will inherently or obviously be substantially uniform, as called for in claims 2232, 2227, 5196, e.g. during an overall field heating process, as illustrated in Figures 2-5. Such permeability increase is deemed to necessarily or inherently encompass an increase to “greater than about 100 millidarcy” or “greater than about 5 Darcy”, as called for in claims 2193, 2226, 2265, 5175; alternatively, to increase the permeability to greater than 100 millidarcy or 5 Darcy would have been an obvious matter of choice in order to ensure adequate fluid flow through the formation.

With further regard to claim 5081, noted above, it is deemed that Ljungstrom (col. 2, lines 1-24) discloses that the coal formation may be “relatively impermeable”; thus it is deemed that such coal formation will inherently or obviously possess an initial permeability of less than 10 millidarcy, depending on the particular formation or field encountered. Alternatively, to choose a coal deposit of such low permeability would have been an obvious matter of choice or design, especially since the process does not require the initial injection of fluid directly into or through the formation.

As per claim 2194, 2233, 5082, 5196, in view of the large number of heat input wellbores or “sources”, relative to a recovery wellbore (26), as illustrated in Figures 2-5 and 9, it is deemed at least some overlap or “superposition” of the heat applied will necessarily or obviously occur,

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especially in ensuring that the entire coal formation extent is heated – which appears necessary in order to provide the “exhaust channels” (40,42) in the coal seam (col. 3, line 48 – col. 4, line 9)

As noted above, pyrolysis clearly occurs in the coal formation, as called for in claims 2195, 2234 and 5177.

As per claims 2199, 2238 the process of Ljungstrom also calls for heating by in situ combustion after an electrical heating phase; such wellbore(s), then, through which in situ combustion is initiated and/or sustained is deemed to necessarily or obviously comprise a “natural distributed combustor”, as broadly recited.

As per claims 2200, 2239, 5178, Ljungstrom specifically discloses that the temperature “may be controlled depending on ... the pressure maintained or permitted to build up” (col. 2, lines 41-45). In addition, the temperature and pressure curves of Figures 10 and 11 appear to indicate a direct relationship between temperature and pressure within the coal formation.

As per claim 2203, 2242, 5180, at least a portion of the heating effected in Ljungstrom is effected “substantially by conduction”, e.g., in the widening of the porous coal layer (30) (see col. 3, lines 29-36).

Regarding claims 2205-2215, 2217, 2218, 2244-2254, 2256, 2257, 5175, 5182-5190, 5192, it is deemed that the myriad hydrocarbon product mixtures recited in these claims would necessarily or obviously occur in carrying out the heating process of Ljungstrom, i.e., the precise composition of the product fluids is seen as dictated by the type of coal naturally occurring in the particular coal formation actually encountered in the field. Moreover, it would be an obvious matter of choice to operate the Ljungstrom process to minimize what would be considered refinery contaminants, such as sulfur, nitrogen and/or oxygen in the product mixtures.

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Similarly, it would be obvious to reduce or minimize the amount of asphaltenes in the product mixtures for optimum downstream refining. Also, in the event that the particular coal deposit encountered yields ammonia gas, it would be an obvious expedient to utilize it in a commercial process such as fertilizer production.

As per claim 5083, since coal, per se, may exist in myriad forms varying in structural, mineral and hydrocarbon content, it is deemed that during the heating of the coal formation in Ljungstrom, i.e., by electrical heating and/or in situ combustion, some "thermal fracturing" of the coal formation may occur, depending the particular coal formation actually encountered in the field.

As per claim 5084, the recited temperature range of 270oC – 400oC is deemed to encompass the exemplary temperature range in Ljungstrom (col. 2, lines 25-42) of 100oC – 250oC for the electrical heating phase, followed by 300oF – 400oC with any difference therebetween deemed an obvious matter of choice or design based on, e.g., the characteristics or type of the particular coal formation encountered in the field.

As per claim 5085, note the use of electrical heating elements (22) in Ljungstrom.

17. Claims 2201, 2202, 2204, 2219, 2222, 2228, 2229, 2240, 2241, 2243, 2258, 2261, 2266, 2267, 5179, 5181, 5193, 5195, 5197, 5198 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ljungstrom (2,923,535).

The precise heating rate and/or thermal conductivity recited in claims 2201, 2202, 2240, 2241, 5179, are deemed obvious matters of choice or design, especially in carrying out the embodiment in Ljungstrom of controlling and/or maintaining the temperature in the coal formation within a specific operating range (col. 2, lines 25-48)

The thermal conductivity recited in claim 2204, 2243, 5181 is deemed an obvious matter of choice or design based on, e.g., the quality and type of the coal formation present and/or the matrix characteristics of the particular coal formation encountered in the field.

The steps of 2219, 2222, 2228, 2258, 2261, 2266, 5193, 5195, 5197 such as controlling the heat or pressure in the formation, are deemed obvious matters of choice or design in carrying out the process of Ljungstrom, consistent with one of the overall objectives of Ljungstrom to control the heating process (col. 2, lines 25-55).

Regarding claims 2229, 2267, 5198, Ljungstrom in the embodiment of Figures 2-5 and 9, discloses that myriad heating wellbores (20) may surround a production wellbore or shaft (26). The precise number of such heating wells provided, as called for in these claims, is deemed an obvious matter of choice or design in carrying out the process of Ljungstrom based on, e.g., the overall areal extent of the coal formation(s) encountered in exploiting an actual reservoir encountered in the field.

18. Claims 2216, 2220, 2221, 2255, 2259, 2260, 5150-5170, 5172-5174, 5191, 5194 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ljungstrom (2,923,535) as applied to claim 2193 above, and further in view of Tsai et al (4,299,285).

While Ljungstrom does not disclose the presence of hydrogen in the coal heating production effluent, Tsai et al (col. 5, line 52 – col. 6, line 15) clearly discloses that gasification/volatilization products resulting from heating and/or gasifying a coal formation include hydrogen.

Accordingly, it is deemed that the volatilized/gasified coal production effluent produced in the process of Ljungstrom will obviously include a hydrogen component, as taught by Tsai et

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al, with the precise amount of hydrogen present, as called for in claims 2216, 2220, 2255, 2259, 5150, 5191, 5194, deemed an obvious expedient or matter of choice to one of ordinary skill in the art to which the invention pertains, based on, e.g., the actual intended use of the production effluent, such as a feed stream to a synthetic natural gas production facility or as process heat gas, as called for in claims.

As per claim 2221, 2260, it would have further been an obvious expedient or matter of choice to monitor the production effluent of Ljungstrom for hydrogen content, especially since Ljungstrom makes specific reference to controlling the process based on, inter alia, "the products desired" (col. 2, lines 42-44).

19. Claims 2216, 2220, 2221, 2223, 2224, 2256, 2259, 2260, 2262, 2263, 5150-5174, 5191, 5194 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ljungstrom (2,923,535) as applied to claim 2193 above, and further in view of Justheim (3,766,982) (applied above).

Justheim'982 injects hydrogen into the heated coal formation to hydrogenate the volatilized/pyrolyzed hydrocarbons evolved; and the hydrogen provided may further be obtained from production fluids obtained from the coal formation (col. 3, lines 1-9).

Accordingly, it would have been obvious to one of ordinary skill in the art to which the invention pertains, to similarly inject hydrogen into the heated coal formation in the process of Ljungstrom, e.g., in the vicinity of the recovery wellbores, and provide the hydrogen from the production effluent, as taught by Justheim, in order to effect a partial hydroconversion/hydrotreating of the volatilized, pyrolyzed and/or gasified hydrocarbons prior to production in order to render the production effluent more suitable for further refining or above-ground processing/conversion, as called for in claims 2223, 2224, 2262, 2263, 5171.

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As per claims 2216, 2220, 2256, 2259, 5150, 5191, 5194, in carrying out the injection of hydrogen into the coal formation to effect hydrogenation of the volatilized/pyrolyzed hydrocarbons evolved, in the modified process of Ljungstrom, the production fluids actually produced will necessarily or obviously include a partial pressure of hydrogen, with the precise amount thereof deemed an obvious matter of choice or design, based on, e.g., the particular coal formation encountered.

As per claim 2221, 2260, insofar as Justheim strives to control the amount of hydrogen present throughout the process to minimize "danger of accidental explosions", it would have been an obvious expedient or matter of choice to monitor the partial pressure of hydrogen at the production well(s) using conventional or commercially-available monitoring means, in carrying out the overall process of Ljungstrom, as modified by Justheim.

20. Claims 2225, 2264 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ljungstrom (2,923,535) in view of Justheim (3,766,982) as applied to claim 2223 above, and further in view of Hoekstra et al (4,353,418) or Garrett (3,661,423).

It would have been obvious to one of ordinary skill in the art to which the invention pertains to further hydrogenate the partially-hydrogenated hydrocarbons produced from the heating process of Ljungstrom, as modified by Justheim'982, with hydrogen circulated or produced by the heating process of Justheim, as taught by Hoekstra et al (note the Abstract and figure) or Garrett (col. 4, lines 50-54), in order to improve the overall quality or advance the refining/processing of the volatilized, pyrolyzed and/or gasified hydrocarbon fluids produced by the process of Ljungstrom, as modified by Justheim'982, by fully or completing hydroconverting/hydrogenating refinement process.

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21. Claims 2230, 2231, 2268, 2269, 5087 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ljungstrom (2,923,535) as applied to claim 2193 above, and further in view of Salomonsson (2,914,309) or Camacho et al (4,067,390).

It would have been obvious to one of ordinary skill in the art to which the invention pertains to carry out the multiple well heating embodiment of Ljungstrom (Figures 2-5 and 9) by providing or laying out the wells in a triangle, and/or repeating triangle pattern, as disclosed by Salomonsson (note Figure 3 and col. 3, lines 5-34) or Camacho et al (note Figure 8) in order to enhance the overall heating/pyrolysis effected by optimizing well location.

22. Claims 5081, 5084, 5086, 5087 and 5090 are rejected under 35 U.S.C. 103(a) as being unpatentable over Justheim (3,237,689) in view of Justheim (3,766,982).

Justheim'689 heats a deposit or formation of "solid carbonaceous material" by circulation of heating medium through one or more heater wellbores, as called for in claim 5086.

Justheim'689 does not explicitly disclose heating of a coal deposit, however, Justheim'982 similarly heats a solid "hydrocarbonaceous" formation, in fact Justheim '982 (note col. 2, lines 30-57) directly refers to Justheim'689, and further indicates that such formation may include coal (note col. 3, lines 10-14).

Accordingly, it would have been obvious to one of ordinary skill in the art to which the invention pertains, to carry out the subterranean heating and hydrocarbon recovery process of Justheim'689 on a coal deposit or formation, as taught by Justheim'982, to realize even greater economic benefit and useful application of the Justheim'689 process.

With specific regard to claim 5081, it is deemed that the "rapid distillation of organic components", "progressive shrinking and fissuring of more remote areas at a rapid rate" of the

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coal formation effected by the process of Justheim'689, as modified, will necessarily or obviously increase the overall permeability of the coal formation. Also, it is deemed that the solid carbonaceous deposit or coal will inherently or obviously possess an initial permeability of less than 10 millidarcy, depending on the particular formation or field encountered.

Alternatively, to choose a coal deposit of such low permeability would have been an obvious matter of choice or design, especially since the process does not require the injection of fluid directly into or through the formation. Thus, the skilled practitioner can recover hydrocarbons from formations not readily accessible to fluid injection.

As per claim 5084, the recited temperature range of 270°C – 400°C is deemed to encompass the exemplary temperature range in Justheim'689 of 200°F – 800°F with any difference therebetween deemed an obvious matter of choice or design based on, e.g., the characteristics or type of the particular coal formation encountered in the field.

As per claim 5087, since one or more of the recovery wellbores (12) may be used to also provide heat to the formation as well (col. 4, lines 72-75), the well pattern illustrated in Figure 2 of Justheim'689 could be construed wherein at least some of the heat source wellbores define "a triangular pattern", i.e., viewing the heat source wellbores in groups of three.

As per claim 5090, it is deemed that the pressure proximate the heat source wellbore(s) (10) is necessarily or obviously of greater pressure than the recovery wellbores (12), otherwise the evolved hydrocarbons would not flow toward such recovery wellbores, as disclosed.

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

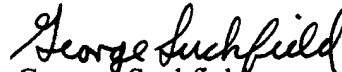
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It is noted that the reference to Bridges et al (4,144,935) also heats a subterranean formation to effect hydrocarbon fluids production, which heating also fractures or increases the formation permeability (note col. 17, lines 15-45). Thus, it is deemed cumulative to the references applied above against one or more of the claims, such as 2193, 2232 or 5081.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Suchfield whose telephone number is 703-308-2152. The examiner can normally be reached on M-F (6:30 - 3:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Bagnell can be reached on 703-308-2151. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7697 for regular communications and 703-305-7697 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.


George Suchfield
Primary Examiner
Art Unit 3672

gs
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